CLAIMS

1.   A method of analyzing a database with indirect relationships, using links and nodes, comprising the steps of:

selecting a node for analysis;

generating candidate cluster links for the selected node, wherein the step of generating comprises an analysis of one or more indirect relationships in the database;

deriving actual cluster links from the candidate cluster links;

identifying one or more nodes for display; and

displaying the identity of one or more nodes using the actual cluster links.

2.   The method of claim 1 wherein each link is given a length, the step of generating the candidate cluster links comprises the steps of:

choosing a number as the maximum number of link lengths that will be examined; and

examining only those links which are less than the maximum number of link lengths.

3.   The method of claim 1 wherein the step of deriving actual cluster links comprises the step of:

117

selecting the top rated candidate cluster links, wherein the top rated candidate cluster links are those which are most closely linked to the node under analysis.

4. The method of claim 3 wherein the selecting step further comprises the step of:

calculating the top rated candidate links using the formula min (constant, 4 * the number of direct links).

5. The method of claim 1 wherein the step of generating the candidate cluster links comprises the step of:

eliminating candidate cluster links, wherein the number of candidate cluster links are limited and the closest candidate cluster links are chosen over the remaining links.

6. The method of claim 1 wherein the step of displaying further comprises the step of:

generating graphics to display the identity of the node, wherein a box is used to graphically represent the node.

118

7.   The method of claim 1, wherein one or more nodes provide external connections to objects external to the database, the method further comprising the steps of:

activating the desired node; and

accessing the external object linked to the node.

8.   The method of claim 7, wherein the external object is an independent application which can be executed in background, the method further comprising the step of:

executing the independent application.

9.   The method of claim 8, wherein one or more nodes provide links to more than one independent application which can be executed as an extension, the method further comprising the steps of:

displaying a list of independent applications linked to the node, wherein the step of accessing accesses an independent application.

10.   The method of claim 8, wherein the connection provides the independent application access to the information stored within the database.

119

11.   The method of claim 7, wherein the external connection is to another computer, wherein information is located that can be accessed, the step of accessing further comprising the step of:

    accessing the information located within the computer.

12.   A method for determining the proximity of an object in a stored database to another object in the stored database using indirect relationships, links, and a display, comprising:

    selecting an object to determine the proximity of other objects to the selected object;

    generating a candidate cluster link set for the selected object, wherein the generating step includes an analysis of one or more indirect relationships in the database;

    deriving an actual cluster link set for the selected object using the generated candidate cluster link set; and

    displaying one or more of the objects in the database, referred to in the actual cluster link set, on a display.

13.   The method of 12 wherein a set of direct links exists for the database, and wherein the step of generating a candidate cluster link set comprises:

    recursively analyzing portions of the set of direct links for indirect links.

14. A method for representing the relationship between nodes using stored direct links, paths, and candidate cluster links, comprising the steps of:

a) initializing a set of candidate cluster links;

b) selecting the destination node of a path as the selected node to analyze;

c) retrieving the set of direct links from the selected node to any other node in the database;

d) determining the weight of the path using the retrieved direct links; repeating steps b through d for each path; and

e) storing the determined weights as candidate cluster links.

15. The method of claim 14 further comprising the step of deriving the actual cluster links wherein the actual cluster links are a subset of the candidate cluster links.

16. The method of claim 15 wherein the step of deriving comprises the step of choosing the top rated candidate cluster links.

17. The method of claim 14 wherein the stored direct links are length L, the paths are counted $i = 0$ to N, the nodes are counted N_0 to N_{i+1}, the weight's of the paths are

121

stored as C_{i+1}, and wherein the step of determining the weight of the path comprises the steps of:

    i)   creating a new path P' of length i+1 consisting of the path P plus the direct link L from the selected node to the node N_{i+1}, for each direct link L;

    ii)   calculating the stored weight of the path (C_{i+1}) comprising the steps of:

deciding whether there already is a path in the cluster link from $Node_0$ to $Node_{i+1}$ and a stored weight, wherein:

if there is a not already a path, the stored weight of the path (C_{i+1}) is set equal to P';

if there already is a path, the combined weight WC_{i+1} is added to the already stored weight of the existing path (in C_{i+1});

wherein the combined weight, WC_{i+1}, is computed from the weight of the path P (WC_i), a dampening factor (D_{i+1}) and the weight of direct Link L (W_{i+1}), and wherein the combined weight is computed using the following formula: $WC_{i+1} = min(WC_i, D_{i+1} * W_{i+1})$; and

    iii)   repeating steps i and ii for each direct link.

18.   A method of analyzing a database having objects and a first numerical representation of direct relationships in the database, comprising the steps of:

generating a second numerical representation using the first numerical representation, wherein the second numerical representation accounts for indirect relationships in the database;

storing the second numerical representation;

identifying at least one object in the database, wherein the stored numerical representation is used to identify objects; and

displaying one or more identified objects from the database.

19.   The method of claim 18 wherein the step of generating a second numerical representation comprises:

selecting an object in the database for analysis;

analyzing the direct relationships expressed by the first numerical representation for indirect relationships involving the selected object; and

creating a second numerical representation of the direct and indirect relationships involving the selected object.

20.   The method of 18 wherein the step of identifying at least one object in the database comprises:

searching for objects in a database using the stored numerical representation, wherein direct and/or indirect relationships are searched.

21.   The method of claim 18 wherein the displaying step comprises:

generating a graphical display for representing an object in the database.

22.   A method for searching indexed objects, wherein the index is stored, comprising the steps of:

entering search commands;

processing the search commands with a processor;

retrieving the stored index using the processor;

analyzing the index to identify a pool of objects, comprising the steps of:

interpreting the processed searched commands as a selection of an object;

identifying a group of objects that have a relationship to the selected object, wherein at least one of the objects in the identified group has a non-semantical relationship with the selected object;

quantifying the relationship of the selected object to each object in the group of objects; and

ranking the objects in the group of objects in accordance to the quantified relationship to the selected object; and

presenting one or more objects from the group of objects in ranked order.

23.   The method of claim 22, wherein the step of identifying comprises:

identifying objects that have similar characteristics to the selected object; and

wherein the step of ranking includes:

the step of eliminating objects from the group of objects that are quantified below a threshold amount.

24. A method for representing objects in a computer database and for computerized searching of the represented objects in the database, wherein relationships exist between or among objects in the database, comprising:

representing objects in the database with node identifications so that each object may be individually identified by a computerized search;

creating a numerical representation of the links or relationships between or among objects in the database;

storing the numerical representation for use in computerized searching; and

searching the node identifications using a computer and the stored numerical representation, wherein each search identifies one or more of the objects in the database.

25. The method of claim 24 wherein the step of creating a numerical representation comprises the step of analyzing indirect relationships in the database.

26.   The method of claim 25 wherein the step of creating a numerical representation further comprises the step of generating cluster links.

27.   A method of representing data in a computer database with relationships, wherein nodes or objects in a database are represented by boxes of a default box size, and wherein various information types may be assigned to node, node sub-types, links, and link sub-types to be placed within the box, and assigned information types contain information, comprising the steps of:

generating links, wherein each link represents a relationship between two nodes and is identified by the two nodes in which the relationship exists;

allocating a weight to each link, wherein the weight signifies the strength of the relationship represented by the link relative to the strength of other relationships represented by other links;

generating link sub-types;

generating node sub-types;

selecting anchor points within the boxes for each information type;

placing each information type at their selected anchor point;

determining whether the information of the placed information type overflows the default box size, comprising the step of:

adjusting the position of the anchor points; and

adjusting the size of the box;

determining whether a placed information type overlaps another placed
information type within the same box comprising the steps of;

adjusting the position of the anchor points; and

adjusting the size of the box; and

displaying the box.

28. A method of representing data in a computer database with relationships,
comprising the steps of:

assigning nodes node identifications;

generating links, wherein each link represents a relationship between
two nodes and is identified by the two nodes in which the relationship exists;

allocating a weight to each link, wherein the weight signifies the
strength of the relationship represented by the link relative to the strength of
other relationships represented by other links; and

displaying a node identification.

29. The method of claim 28, wherein the data in the database is objects, wherein
the nodes represent objects and each object is assigned a node identification, and
wherein the relationships that exist comprise direct relationships between objects,
further comprising the step of:

searching generated links, wherein nodes are located by searching the
generated links.

30.   The method of claim 28 further comprising the step of:

generating link sub-types, comprising the steps of:

identifying each link sub-type with a name; and

providing a comment to one or more link sub-types.

31.   The method of claim 30 further comprising the step of:

specifying the place to display the comment using a comment place

holder.

32.   The method of claim 31 wherein multiple comments are provided to a link

sub-type, further comprising the step of:

specifying the order multiple comments appear in the comment place

holder using a comment display order, comprising the steps of:

assigning each comment a value;

ranking the comments in order of their assigned value; and

displaying the comments in order of their rank.

33.   The method of claim 30 further comprising the step of:

determining whether the comment will appear in all displays using

the always display command, comprising the steps of:

assigning each comment a binary value based on its importance;

displaying comments which have been assigned the first binary value on all displays;

suppressing comments which have been assigned the second binary value from all displays wherein only one node of the link sub-type is displayed.

34. The method of claim 31 wherein icon files are assigned to link sub-types.

35. The method of claim 31 wherein visual styles are assigned to link sub-types.

36. The method of claim 28 wherein attributes are assigned to nodes.

37. The method of claim 36 further comprising the step of:

generating node sub-types wherein the node sub-types are assigned information.

38. A method of representing data in a computer database and for computerized searching of the data, wherein relationships exist in the database, comprising:

assigning links to represent relationships in the database;

generating node identifications based upon the assigned links, wherein node identifications are generated so that each link represents a relationship between two identified nodes;

storing the links and node identifications, wherein the links and nodes may be retrieved;

searching for node identifications using the stored links; and

displaying node identifications, wherein the displayed node identifications are located in the searching step.

39.   A method for visually representing data using a computer and an X, Y, Z coordinate plane wherein nodes or objects in a database are represented by boxes, comprising:

generating a box having at least three visible sides, wherein at least one side represents the depth of the box and wherein the magnitude of the depth of the box represents a relative measure of the amount of data associated with that box; and

means for displaying the generated box with associated depth on an X, Y, Z coordinate plane.

40.   A method of displaying data using a graphical user interface and a pool of result nodes, wherein data from a result node appears in an object directly linked to a search node comprising:

receiving the identity of nodes in a pool to be displayed;

accessing data indicating a first relationship between nodes in the pool and data indicating a second relationship between nodes in the pool;

determining a coordinate X/Y location for each identified node in the pool based upon the data indicating a first and second relationship;

generating a window with an X axis and Y axis;

creating a box for each identified node;

placing the box for each identified node in the correct X/Y position in the window; and

displaying the window with one or more boxes.

41.   The method of claim 40 wherein a screen is used and the step of placing the box for each identified node in the correct X/Y position includes the steps of:

determining if any box overlaps with any other box including the steps of:

adjusting the position of boxes which overlap; and

determining if any box overlaps with any other box;

repeating adjusting and determining steps until no boxes overlap;

determining if all the boxes can be shown in one screen including the steps of:

increasing the size of one axis if one or more boxes cannot be shown in one screen;

determining if all of the boxes can be shown in one screen;

repeating increasing and determining steps until all of the boxes can be shown in one screen;

placing the box for each identified node in the correct X/Y position in the window; and

determining if any box overlaps with any other box including the steps of:

adjusting the position of boxes which overlap;

determining if any box overlaps with any other box; and

repeating adjusting and determining steps until no boxes overlap;

42.   The method of claim 40 including the steps of:

activating a box representing a result node, wherein the result node is activated;

executing a show usage command;

displaying data in the object directly linked to the search node which correlates to data in the activated result node.

43.   The method of claim 40 wherein the data in the object directly linked to the search node is grouped in marked records with identifiers, wherein one or more identifiers are result node identifiers, and the step of executing comprises the step of:

searching the marked records in the object directly linked to the search node for the result node identifier.

44.   A method of displaying a pool of identified nodes using a graphical user interface and background types, comprising the steps of:

receiving the identity of nodes in a pool;

collecting data indicating a first relationship between nodes in the pool and data indicating a second relationship between nodes in the pool;

determining a coordinate X/Y location for each identified node in the pool based upon the data indicating a first and second relationship comprising the steps of:

comparing the data indicating the first relationship for determining an X coordinate for each node; and

comparing the data indicating the second relationship for determining a Y coordinate for each node;

generating a window with an X axis and Y axis;

creating a box for each identified node;

placing the box for each identified node in the correct X/Y position in the window;

choosing one or more values on the X or Y axis;

assigning one or more background types to the window based on the one or more chosen values, wherein more than one background type is used for a window; and

displaying the window.

- 132 -

45.   The method of claim 44 wherein a look-up table containing different types of output devices are stored with their corresponding bitmaps, wherein the step of assigning a background type includes the steps of:

determining the type of display or output device being used; and

accessing the look-up table to assign a background type to the window, wherein the determined type of the display or output device is used to access the look-up table.

46.   The method of claim 44 wherein the step of choosing is done automatically by the processor, wherein the pool of identified nodes is a result of a search using a search node, the step of choosing comprising:

determining the search node's occurrence on the X-axis, and the step of assigning comprises the steps of:

assigning a first background type to the portion of the window occurring after the search node's occurrence on the X-axis; and

assigning a second background type to the portion of the window occurring before the search node's occurrence on the X-axis.

47.   The method of claim 44 wherein the step of choosing is done by the user, the method further comprising the steps of:

entering an X or Y value for the particular point on the axes at which the background type will change; and

- 133 -

the step of assigning further comprising the steps of:

assigning a first background type to the portion of the window occurring after the chosen value's occurrence on the X-axis; and

assigning a second background type to the portion of the window occurring before the chosen value's occurrence on the X-axis.

48. A method of displaying a pool of nodes stored in a database in a graphical user interface using background types, wherein the node represents a type of data, comprising the steps of:

receiving the identity of nodes to be displayed;

collecting data indicating a first relationship between nodes in the pool and data indicating a second relationship between nodes in the pool;

determining a coordinate X/Y location for each identified node in the pool based upon the data indicating a first and second relationship;

generating a window with an X axis and Y axis;

creating a box for each identified node;

placing the created box for each identified node in the correct X/Y position in the window; and

displaying the window with one or more placed boxes comprising the step of:

assigning a fill type for each placed box.

49. The method of claim 48 including the steps of

selecting a fill type to represent each data type;

storing the selected fill type in a look-up table; and

the step of displaying the window further comprising the step of:

determining the type of display or output device being used;

the step of assigning a fill type further comprising the steps of:

identifying the data type of the node represented by the placed box; and

accessing the look-up table to assign a fill type to the placed box,

wherein the identified data type of the node and the determined type of the

display or output device are used to access the look-up table.

50. A method for using active links within the data of an object in a stored

database so that a user may jump from viewing the data of the object in the database

to a position outside the object in the database, comprising:

storing links within data of an object in a database to points outside of

that object in the database wherein the stored links are active links;

displaying the data of an object within a database wherein one or more

active links are displayed with the data from the object in the database; and

selecting a displayed active link from within the displayed data;

jumping to a position which is outside the object in the database which

is being displayed.

51. The method of claim 50 wherein the step of jumping further comprises:

   generating a menu with a selection of one or more places for the user

to jump to.

52. The method of claim 50 wherein the links are embedded icons and wherein

the step of selecting comprises the step of activating an embedded icon.

53. The method of claim 50 wherein the active link is embedded text wherein the

step of selecting comprises the step of activating the embedded text.

54. The method of claim 50 wherein computer software is used, further

comprising the step of:

   generating an active link, wherein the link can be used to jump from a

location in the database to another location in the database or to a different

position in the software.

55. A method of integrating two computer software applications wherein the two

applications appear to run simultaneously to a user, and wherein the first

application subclasses the second application, comprising the steps of:

   subclassing the second application, wherein the first application

subclasses the second application;

- 136 -

receiving messages intended for the subclassed application, wherein the first application receives the messages;

recognizing the received message, wherein the first application recognizes the received message;

forwarding one or more of the recognized messages to the subclassed application, wherein the first application forwards the recognized message to the subclassed application; and

processing the forwarded message, wherein the subclassed application process the forwarded messages.

56.   The method of claim 55 wherein the two computer programs operate in a windows environment, the first application controls the frame window and the subclassed application controls one or more native child window displays, and

wherein the step of receiving messages intended for the subclassed application includes the receipt of messages intended for a window native to the subclassed application; and

wherein the step of processing further comprises the step of:

changing a child window display.

57.   The method of claim 56 wherein the windows environment includes a multiple document interface, and at least one of the two computer applications is a database manager, further comprising:

generating a display, wherein the display is comprised of one or more windows.

58. The method of claim 57 wherein the subclassed application has more than one native window display.

59. The method of claim 58 wherein more than two computer applications are integrated, and more than one computer application is subclassed.

60. A method for arranging a desired number of activated windows of information for display on a screen connected to a computer, wherein the desired number is the number of activated windows to arrange for display on the screen in a particular format, and wherein the computer activates windows, the method comprising the steps of:

identifying activated windows for display, wherein the number of activated windows identified for display equals the desired number of activated windows to be displayed in a particular format, wherein the desired number of activated windows to be displayed is greater than one, and wherein the most recently activated windows are identified for display;

arranging the identified windows on the screen for display in a particular format, wherein the identified windows are visibly arranged; and

- 138 -

wherein each time a new window is activated the steps of identifying and arranging are repeated.

61.   The method of claim 60 further comprising the step of choosing the desired number of activated windows to arrange on the screen in a particular format.

62.   The method of claim 60 wherein the desired number of activated windows to arrange on the screen is a default value.

63.   The method of claim 60 further comprising the step of recognizing one or more activated windows which have not been identified for display and will not be arranged for display on the screen in a particular format.

64.   The method of claim 63 wherein an activated window not identified for display may be represented on the screen with a representative display, the method further comprising the step of representing one or more recognized windows on the screen with a representative display.

65.   The method of claim 64 wherein the representative display is an icon which graphically represents the recognized window and wherein the icon is displayed simultaneously with an identified window.

66. The method of claim 63 further comprising the step of minimizing, wherein a recognized window is minimized.

67. A method for displaying active information windows on a screen, wherein the information windows are generated by a computer and the screen is operably connected to the computer, and wherein the active information windows may be displayed in two or more formats, comprising the steps of:

identifying at least one active window, wherein the identified windows will be displayed in a first format on the screen,

recognizing at least one active window, wherein the recognized windows will be displayed in a second format on the screen, and wherein none of the identified active windows are recognized; and

generating a display on the screen for viewing identified windows and recognized windows, wherein a first format display is generated for each of the identified windows, wherein a second format display is generated for each of the recognized windows, and wherein the second format is different from the first format, comprising the steps of:

arranging the first format displays and second format displays for display on a screen, wherein the computer is used in the arranging step; and

repeating the steps of identifying, recognizing and generating when a new window is activated.

- 140 -

68.   The method of claim 67 wherein the steps occur automatically each time a new window is activated.

69.   The method of claim 67 wherein the second format is graphic icons and the graphic icons are arranged to overlay on the first format display and wherein the method further comprises the step of icon arranging, wherein the icons are arranged in an orderly fashion.

70.   The method of claim 67 wherein the first format displays are arranged vertically side-by-side.

71.   The method of claim 67 wherein the first format displays are arranged horizontally.

72.   The method of claim 67 wherein the generating step further comprises minimizing the recognized windows.

73.   The method of claim 67 wherein a database manager is used and wherein the step of generating further comprises accessing a database of information and using the accessed database information to generate the first format displays.

74. A database management system using windows of information and auto-arranging of windows, wherein each time a previously inactive window is activated the system autoarranges the windows for display on a screen, comprising:

memory, wherein data for use in generating information windows is stored;

a processor, operably coupled to the memory, for auto-arranging windows of information; wherein the windows of information are automatically arranged, comprising:

means for generating windows of information using data from the memory; and

means for auto-arranging windows of information into an arranged format, wherein more than one window may be arranged, and wherein each time a previously inactivate window is activated, all the active windows are arranged so that the arrangement of windows changes each time a previously inactivate window is activated; and

a screen, operably coupled to the processor, wherein the screen displays information windows in an arranged format.

75. The database management system of claim 74, wherein the means for auto-arranging windows comprises:

means for determining windows to be arranged in a first format and windows to be arranged in a second format, wherein at least one window is determined to be arranged in a first format.

76. The database management system of claim 75 wherein the windows determined to be arranged in a second format are represented by graphical icons and displayed in the lower portion of one or more of the first format window

77. The database management system of claim 74 wherein the arranged format is a targeted format chosen by a user of the database management system, further comprising:

means for choosing a target format.

78. The database management system of claim 77 wherein the user may enter a customized target format, further comprising a keyboard, wherein a customized target format may be entered.

79. The database management system of claim 77 wherein the user may choose from several different formats, the system further comprising means for displaying a list of formats to be chosen.

80.   A method for displaying information about a network which has hyperjump data, comprising:

choosing a node;

accessing hyperjump data;

identifying hyperjump data from within the accessed hyperjump data that has a direct reference to the chosen node;

determining hyperjump data from within the accessed hyperjump data that has an indirect reference to the chosen node using the identified hyperjump data; and

displaying one or more determined hyperjump data.

81.   The method of claim 80 wherein the hyperjump data includes pointers and wherein the direct reference is a pointer pointing to the chosen node or from the chosen node, and the step of determining comprises the step of analyzing the pointers.

82.   The method of claim 80 wherein the node represents a topic, the determined hyperjump data has a relationship to the topic, and the step of displaying displays hyperjump data that has a relationship to the topic.

83.   The method of claim 80 wherein the node is a web page in the network, the accessed hyperjump data are Universal Resource Locators of the linked pages, and

the step of determining hyperjump data comprises analyzing the identified hyperjump data.

84. The method of claim 80 wherein the node is a document in the network and the determined hyperjump data has a relationship to the document, the step of displaying comprises the step of listing the hyperjump data that has a relationship to the document.

85. The method of claim 80 wherein the step of determining comprises the step of proximity analyzing the identified hyperjump data.

86. The method of claim 80 wherein the step of determining comprises the step of cluster analyzing the hyperjump data.

87. The method of claim 80 wherein the step of displaying comprises generating a graphical user display, wherein information is displayed on a graphical display visually representing more than one coordinate plane.

88. The method of claim 80 wherein the nodes are nodes in the network which may be accessed, the hyperjump data includes hyperjump links between nodes in the network and the step of displaying comprises:

generating a source map using one or more of the determined hyperjump data, wherein the map represents hyperjump links which identify the chosen node as the destination of the link; and

wherein the method further comprises the step of activating a link represented on the source map, wherein a user may hyperjump to the node represented as the from node of the link.

89.　A method for visually displaying data related to a web having identifiable web pages and Universal Resource Locators with pointers, comprising:

choosing an identifiable web page;

identifying Universal Resource Locators for web pages, wherein the identified Universal Resource Locators either point to or point away from the chosen web page;

analyzing Universal Resource Locators, including the identified Universal Resource Locators, wherein Universal Resource Locators which have an indirect relationship to the chosen web page are located; and

displaying the identities of web pages, wherein the located Universal Resource Locators are used to identify web pages.

90.　The method of claim 89 wherein the step of analyzing further comprises cluster analyzing the Universal Resource Locators for indirect relationships.

91. The method of claim 89 further comprising the step of selecting a web page using the displayed identities of web pages.

92. The method of claim 91 further comprising the step of hyperjumping to the selected web page.

93. The method of claim 89 wherein the step of displaying the identities of web pages comprises the step of generating a graphical user display wherein information within the Universal Resource Locators is parsed and used to generate the graphical user display.

94. A method for navigating documents on the world wide web, comprising:

    choosing a document;

    identifying documents which have a direct relationship to the chosen document;

    locating documents which have an indirect relationship to the chosen document; and

    displaying a located document.

95. The method of claim 94 wherein pages and their respective Universal Resource Locators are used and the step of locating documents comprises the step of analyzing pages and their respective Universal Resource Locators.

96.   The method of claim 95 wherein the step of analyzing pages comprises the step of cluster analyzing the pages.

97.   The method of claim 94 wherein the step of displaying a located document comprises:

        generating a screen display of the identities of one or more located documents; and

        selecting one or more of the located documents.

98.   The method of claim 97 wherein the step of generating a screen display comprises the step of generating a graphical display.